Notice of Allowability	Application No.	Applicant(s)	
	10/050,507	LEE, TECK KHENG	
	Examiner	Art Unit	
	Craig A. Thompson	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *communication of 5/18/2004*.

2. ☒ The allowed claim(s) is/are *1-50,53-95 and 116-164*.

3. ☒ The drawings filed on *16 January 2002* are accepted by the Examiner.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 3/12/2002;4/25/2003; 9/29/2003
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material 10/20/03
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

REASONS FOR ALLOWANCE

The following is an examiner's statement of reasons for allowance:

Flexible Film Interposer and Interposer

Prior art of record does not describe or suggest applicant's flexible film interposers including the inventions of: claims 1-21, wherein a plurality of conductive traces are disposed on the second surface of a substrate, each trace extending over a slot and at least one recess, each of the recesses having a trace disposed at the base thereon, used in conjunction with a flexible substrate and a slot formed through the substrate, in the context of the recited interposer; claims 22-23 wherein a plurality of conductive traces are disposed on the second surface of an interposer, each trace extending over and exposed through a slot and at the base of at least one of the recesses, each recess having a trace disposed at the base thereof, in the context of the recited interposer; and claims 24-26, wherein a plurality of conductive traces are disposed on the second surface of the interposer, each trace extending over and exposed through a slot and one of the recesses in conjunctionwith a plurality of recesses formed through the interposer and adjacent the slot, in the context of the recited interposer.

Prior art of record also does not describe or suggest applicant's flexible film interposers including the inventions of: claims 27-31, wherein a plurality of conductive traces are disposed on the second surface of the interposer, each trace extending across and exposed through a slot and the base of one or more adjacent recesses in a perpendicular orientation to the slot, in conjunction with the elongate slot formed

through the interposer and the plurality of recesses, in the context of the recited interposer; claim 32, wherein a plurality of conductive traces are disposed on the second surface of the interposer in a perpendicular orientation to a slot, each trace extending across and exposed through the slot and the base of at least one recess, each of the recesses having a trace disposed at the base thereof, in the context of the recited interposer; claims 33-36, wherein a plurality of conductive traces are disposed on the second surface of the interposer in a perpendicular orientation to a slot, each trace extending across and exposed through the slot and the base of at least one recess, in the context of the recited interposer; and finally claims 37-38, wherein a flexible substrate comprises a first and second surface and opposing sides, a first surface of the substrate is structured for mounting thereon a first semiconductor die, the first surface of the substrate comprises a plurality of spaced apart recesses having a base and extending through the substrate for receiving a plurality of conductive connecting members of the first semiconductor therein and the second surface of the substrate comprises one or more slots extending through and along a periphery of the substrate wherein the second semiconductor die is mounted thereon and the bonding pads are exposed through the slots, in the context of the recited interposer.

Prior art of record does not describe or suggest applicant's invention set forth in claims 147-151, an interposer comprising a flexible substrate comprising first and second surfaces, a plurality of recesses disposed through the substrate and having a base at the second surface of the substrate, with each recess sized and configured to receive therein a conductive member disposed on an active surface of the first die when

flip-chip mounted onto the first substrate, and a slot disposed through the substrate and slot sized and configured to receive a bonding tool therethrough to contact bond pads of a second die when disposed on the second surface of the substrate, in the context of the recited interposer.

Semiconductor Device and Package

Prior art of record does not describe or suggest applicant's invention including: the semiconductor device of 39-50 and 53-56 wherein a first semiconductor die has a first active surface and a second surface, the active surface comprising a plurality of spaced apart conductive members in conjunction with a flexible film interposer comprising a first surface and a second surface, an elongate slot formed through and along a peripheral edge of the interposer to expose bond pads on a second semiconductor die when mounted onto the second surface of the interposer, a plurality of spaced apart recesses formed through the interposer and adjacent the slot, each recess having a base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of at least one recess in a perpendicular orientation to the slot and each of the recesses having a trace disposed at the base thereof, in the context of the recited die.

Prior art of record also does not describe or suggest: the semiconductor device of claims 57-62 and 63 wherein a first semiconductor die has a first active surface and a second surface, the active surface comprising a plurality of spaced apart conductive connecting members, and a flexible film interposer comprising a first surface and a

second surface, an elongate slot along the peripheral edge (for instance of the interposer, as in claim 63), a plurality of spaced apart recesses formed through the interposer adjacent the slot, each recess having a base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of at least one recess in a perpendicular orientation to the slot, each of the recesses having a trace disposed at the base thereof, in the context of the recited devices; and finally the device of claims 64-67, wherein a first semiconductor die has a first active surface and a second surface, the first comprising a plurality of spaced apart conductive connecting members, and a flexible film interposer comprising a first surface, a second surface and opposing sides, an elongate slot along the peripheral edge, a plurality of spaced apart recesses formed through the interposer adjacent to the slot, each recess having a base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of at least one recess, in the context of the recited device.

Prior art of record does not describe or suggest applicant's invention set forth in claims 89-95, a semiconductor package comprising an encapsulated die assembly which comprises first and second semiconductor die mounted on a flexible film interposer and the second die further mounted on an interposer substrate wherein the flexible film interposer comprises a first and a second surface, an elongate slot formed through and along a peripheral edge of the interposer, a plurality of spaced apart recesses formed through the interposer and adjacent the slot, each recess having a

base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of one or more adjacent recesses in a perpendicular orientation to the slot, in the context of the recited package.

Die Assembly, Stacked Die Assembly, Die Package and Apparatus

Prior art of record does not describe or suggest: the stacked die assembly of claims 68-81 including a flexible film interposer comprising a first surface and a second surface, an elongate slot formed through and along a peripheral edge of the interposer, a plurality of spaced apart recesses formed through the interposer and adjacent the slot, each recess having a base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of one or more recesses in a perpendicular orientation to the slot, each of the recesses having a trace disposed at the base thereof, in conjunction with the first and second dies in the context of the recited assembly; or the stacked die assembly of claims 82 and 83, wherein the flexible film interposer comprises first and second surfaces and opposing sides with the first and second dies in the context of the recited assembly.

Prior art of record does not describe or suggest: the stacked die assembly of claims 84 and 85 including a flexible film interposer comprising a first surface, a second surface and opposing sides, an elongate slot along a peripheral edge, a plurality of spaced apart recesses formed through the interposer adjacent the slot, each recess

having a base, and a plurality of conductive traces disposed on the second surface of the interposer, each trace extending across and exposed through the slot and the base of at least one recess, each of the recesses having a trace disposed at the base thereof, in conjunction with the first and second dies in the context of the recited assembly; and finally the stacked die assembly of claims 86-88 including a flexible film interposer comprising a first surface, a second surface and opposing sides, a slot along a peripheral edge, a plurality of spaced apart recesses formed through the interposer adjacent the slot, each recess having a base, and a plurality of conductive traces disposed on the second surface of the interposer in a perpendicular orientation to the slot, each trace extending across and exposed through the slot and the base of at least one recess, each recess having a trace disposed at the base thereof, in conjunction with the first and second dies in the context of the recited assembly.

Similarly, prior art of record does not describe or suggest the die assemblies of claims 116, 117, 118, 119 (and dependent claims 120-125), 126 (and dependent claims 127-129) and 130 (and dependent claims 131-138) each of which include an interposer comprising first and second surfaces, an elongate slot formed through and along a peripheral edge of the interposer, one or more recesses disposed through the interposer adjacent the slot, and one or more conductive traces disposed on the second surface of the interposer and extending across and exposed through the slot and at least one recess, in the contexts of the recited assemblies.

Prior art of record does not describe or suggest the die packages of 139, 140, and 141 which comprise the at least partially encapsulated die assemblies of claims

116, 117, and 118, respectively. Prior art of record also does not describe the apparatus of claims 142-144, and 145-146 which depend on directly or indirectly and comprise the die packages of claims 139 and 140, respectively.

Prior art of record does not describe or suggest the invention of claims 152-160, a die assembly comprising a die flip chip disposed on an interposer and comprising a first surface comprising a plurality of spaced apart conductive connecting members and a second surface, the interposer comprising a flexible substrate and first and second surfaces, a plurality of recesses extending through the interposer from the first surface to the second surface, each recess sized and configured to receive therein a conductive connecting member of the die disposed on the first surface of the interposer, and a slot disposed through the interposer to receive a bonding tool therethrough to contact pads of a second die when disposed on the second surface of the interposer.

Finally, prior art of record does not describe or suggest the invention of claim 161, a die package comprising the die assemble of claim 152, of the inventions of claims 162-164, an apparatus comprising the die assembly of claim 152.

Regarding Comments by Applicant

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Cited Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Murtuza (US Patent Publication No. US 2001/0048157 A1) teaches a chip scale package for flip chip devices (abstract). One alternate embodiment includes the use of flexible film interposers (see paragraph [0038] and Figure 3). Moon et al. (U.S. Patent No. 6,552,910 B1) teaches a stacked die assembly for microelectronic devices (abstract and title). The interface substrate (which is an interposer, see figure 1 item 130) is taught to be a thin flexible substrate or a tape that bonds the first and second dies (column 3, lines 37-50).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig A. Thompson whose telephone number is (571)272-1699. The examiner can normally be reached on Monday-Friday 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571)272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Craig A. Thompson
Primary Examiner
Art Unit 2813

16 September 2004